REMARKS

In view of the preceding amendments and the comments which follow, and pursuant to 37 C.F.R. § 1.111, amendment and reconsideration of the Official Action of December 16, 2003 is respectfully requested by Applicants.

Summary

Claims 3 - 6 stand rejected. Claims 3 and 4 are amended. Claims 4 and 5 are cancelled. No new matter has been introduced as a result of these amendments.

Claims 3 - 4 are pending following entry of the present amendments.

Rejection under 35 U.S.C. § 103

The Examiner has rejected claims 3 and 4 under 35 U.S.C. 103(a) as being unpatentable over Ju et al. (U.S. 5,285,340) in view of Fahy et al. (U.S. 4,345,007). Claims 3 and 4 have been amended to clarify the claimed invention and to remove any ambiguity that may have been the basis for the rejections. In particular, independent claim 3, directed to a method for making a thin-film magnetic head, has been rewritten to further recite that "wherein at least the substantially flat lower magnetic pole layer and the substantially flat gap layer are formed by an electrolytic plating process using a pulsed current." Applicants submit that pending claim 3 overcomes the rejection.

These amendments find support in the specification, namely on page 18, lines 13 – 17, which states that "Also, the lower core layer 20, the gap layer 22, the upper magnetic pole layer 35, the coil layer 29, and the upper core layer 26 may be formed by an electrolytic plating process using a pulsed current." Thus, the gap layer and the lower magnetic pole layer are electroplated on the magnetic head using pulsed current, in contrast to Fahy et al. which uses conventional DC plating processes.

Conventional DC plating processes use stationary or constant currents and tend to lead to a warping of a layer to be formed, whereas the

electroplating process using pulsed current leads to a formation of flat deposited layers, such as the lower magnetic pole layer, the gap layer, or the upper magnetic pole layer. Typically, DC plating results in mushroom-shaped deposits, which limit the proximity of one line trace to another in fine pattern plating. With the use of pulsed current electroplating, circuit traces can be positioned closer together without shorting one another. As such, high-density circuits can increase in numbers on a given surface dimension, and increased circuit density in thin-film magnetic heads for computer disc drives allows for greater magnetic strength of the head. Further, due to the formation of flat deposited layers, a magnetic head produced by the claimed method can write or record a linear magnetic pattern, instead of a curved pattern, on a magnetic recording media, such as a magnetic disk. As a result, a typical magnetic head can read such recorded magnetic pattern on the corresponding magnetic recording media with high sensitivity.

In addition, a NiP gap layer with a uniform P content, in the range of 11 mass percent to 14 mass percent, can be formed by the electroplating method using a pulsed current. However, in conventional electroplating processes using stationary currents, as the thickness of the gap layer decreases the initially low P content portion occupies a larger proportion in the layer and thus adversely affects recording characteristics. As such, the plated layer portion shows incomplete nonmagnetic characteristics, which leads the gap layer to not function satisfactorily as a nonmagnetic layer. Furthermore, the low P content portion in the plated layer exhibits poor corrosion resistance, which may cause localized corrosion. In contrast, the electroplated portion of the NiP layer, using a pulsed current, is formed with a desired P content within a variation of 11% to 14% through out the thickness of the NiP layer. Therefore, the entire NiP layer is nonmagnetic, and a produced thin film magnetic head can write recording signals on a recording medium without errors or distortions. In addition, the uniform P content in the NiP layer does not cause localized corrosion in the vicinity of an interface between the gap layer and the lower magnetic pole layer.

Further, the Examiner stated that although both Ju and Fahy references are silent on the electroplating process utilizing a pulsed current, the reference Sun et al. does disclose a method of electroplating with a pulsed current. However, although the Sun et al. reference does disclose an electroplating of the element Nickel onto substrates using a pulsed current, it does not disclose or suggest the electroplating of Nickel alloys containing a plurality of elements and a desired distribution of these elements in an electroplated layer. Thus, Sun et al. fails to disclose or suggest the electroplating of a NiP layer with a desired P content. Still further, Sun et al. fails to disclose the electroplating using pulsed current on a groove such as groove 9a of Figure 17 or groove 30a of Figure 13, and therefore do not suggest the unexpected advantage of forming a flat plated layer on a groove using pulsed current.

Hence, the Ju, Fahy, and Sun references, either taken alone or in combination with each other, fail to suggest the features and limitations of Claim 3. As such, claim 3 is patentable over Ju et al. in view of Fahy et al, and in further view of Sun et al. Applicants submit that claim 4 has been amended in a similar manner to claim 3, and as such is similarly patentable over the same references, and therefore respectfully request that the rejection of claims 3 and 4 under 35 USC 103(a) be withdrawn.

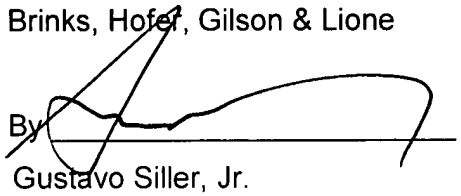
Conclusion

Applicants submit that this application is now in condition for allowance, and favorable reconsideration of this application in view of the above amendments and remarks is respectfully requested. Allowance of claims 3 and 4 at an early date is earnestly solicited. If, there are additional fees due, Applicants request that this paper constitutes any necessary petition and authorizes the Commissioner to charge any underpayment, or credit any overpayment, to Deposit Account No. 23-1925.

If the examiner finds that there are any outstanding issues which may be resolved by a telephone interview, the Examiner is invited to contact the undersigned at the below listed number

Respectfully submitted,

Brinks, Hofer, Gilson & Lione

By 

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